

Mars Trek: An Interactive Web Portal for Current and Future Missions to Mars

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Abstract

NASA's Mars Trek (<https://marstrek.jpl.nasa.gov>) provides a web-based Portal and a suite of interactive visualization and analysis tools to enable mission planners, lunar scientists, and engineers to access mapped data products from past and current missions to Mars. During the past year, the capabilities and data served by Mars Trek have been significantly expanded beyond its original design as a public outreach tool. At the request of NASA's Science Mission Directorate and Human Exploration Operations Mission Directorate, Mars Trek's technology and capabilities are now being extended to support site selection and analysis activities for the first human missions to Mars.

1. Introduction

This presentation will provide an overview of the uses and capabilities of NASA's Mars Trek online mapping and modeling portal, a web based suite of data visualization and analysis tools designed to support mission planning, scientific research, and education/outreach.

2. A Comprehensive Online Web Portal

Mars Trek integrates a suite of interactive tools incorporating observations from past and current missions. The online web portal allows anyone with access to a computer to search through and view a vast number of coregistered images and other digital products. As a web-based application, Mars Trek does not require users to purchase or install any software beyond current web browsers. The portal provides easy-to-use tools for browsing, data layering, and feature search. Current tools include distance measurement, elevation profiling, and calculating

Sun angles. Data sets include photographic, spectrometric, mineralogy, thermal, and landform data, as well as DEMs generated from stereo imagery and laser altimetry.

Originally released in June, 2015 as a public outreach tool, Mars Trek is currently being enhanced to support site selection and analysis for upcoming human and robotic missions to Mars. Many new data products are being added, with emphasis on providing detailed information for proposed exploration zones. New tools will include lighting analysis, slope mapping, crater detection, boulder detection, and traverse planning. Users will be able to download data products from Mars Trek and access metadata for each product. Web services and APIs will allow other clients to access data from Mars Trek's servers. A new interface for Mars Trek will provide consistency with the range of NASA Trek platforms including portals for the Moon, Vesta, Phobos, and more. This interface provides for advanced 3D visualization and navigation. Standard keyboard gaming controls allow the user to maneuver a first-person visualization of "flying" across the surface of the Moon. User-specified bounding boxes can be used to generate STL and/or OBJ files to create physical models of surface features with 3D printers.

Mars Trek is also a powerful tool for education and outreach, as is exemplified by its being designated as key supporting infrastructure for NASA Science Mission Directorate's STEM Activation Initiative, and its serving of data to a growing community of digital planetariums.

As private industry and space agencies of a growing number of nations plan new missions to Mars, detailed maps and models of Mars' surface and climate will be essential for mission planning. Mars Trek's generalized suite of tools are being designed to meet the needs of this new generation of missions.

The portal will also provide an outstanding means of dissemination of data from these missions. Layering and blending many different data products and putting individual products in the context of many others will facilitate mining of information going far beyond what individual products can provide separately. In addition to mission planning and planetary science, Mars Trek will continue supporting the essential task of engaging the public in this great adventure.

Mars Trek is developed at NASA's Jet Propulsion Laboratory (JPL) and managed as a project of NASA's Solar System Exploration Research Virtual Institute (SSERVI) at NASA Ames Research Center.

3. Extension to Phobos

At the request of the Planetary Science Division of NASA's Science Mission Directorate, we are extending the technologies of our existing Trek platforms to create a new portal for Mars' largest moon, Phobos. In this effort, we are working with the International Phobos/Deimos Landing Site Working Group and with JAXA, with JAXA's MMX mission as a primary driver.

4. Summary and Conclusions

Mars Trek's new features make it especially useful for the planning of a new generation of Mars exploration missions, conducting a wide range of Mars planetary science research, and facilitating exciting visualizations and exploration in the realms of education and outreach. The user community is invited to provide suggestions and requests as the development team continues to expand the capabilities of Mars Trek, its related products, and the range of data and tools that it provides. As the EPSC community looks forward to a new generation of surface and orbital robotic activities at Mars, as well as preparation for the first human missions to Mars, tools such as Mars Trek will become increasingly essential.

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